

WHAT IS CLAIMED IS:

1. A color OLED display device, comprising:
 - a) an array of light emitting pixels, each pixel having red, green,
5 and blue OLEDs and at least one additional colored OLED that expands the
gamut of the display device relative to the gamut defined by the red, green and
blue OLEDs, wherein the luminance efficiency or the luminance stability over
time of the additional OLED is higher than the luminance efficiency or the
luminance stability over time of at least one of the red, green, and blue OLEDs;
10 and
 - b) means for selectively driving the OLEDs with a drive signal to
reduce overall power usage or extend the lifetime of the display while maintaining
display color accuracy.
- 15 2. The display device claimed in claim 1 wherein the means for
driving the OLEDs results in a drive signal to produce a given color and
luminance at a reduced power usage.
- 20 3. The display device claimed in claim 2, wherein the means for
driving considers the luminance efficiency of each OLED to deliver the reduced
power usage.
- 25 4. The display device claimed in claim 1, wherein the means for
driving the OLEDs results in a drive signal to produce a given color and
luminance at an improved lifetime.
- 30 5. The display device claimed in claim 4, wherein the means for
driving considers the luminance efficiency of each OLED to deliver the improved
lifetime.

6. The display device claimed in claim 4, wherein the means for driving considers the luminance stability over time of the material used to form each OLED to deliver improved lifetime.

5 7. The display device claimed in claim 1, wherein the drive signal is dependent upon a control signal.

8. The display device claimed in claim 7, wherein the control signal varies as a function one or more of a set including a resistance, voltage,
10 current, temperature, ambient illumination, display luminance, and/or scene content.

9. The display device claimed in claim 1, wherein the means for driving produces a constant ratio of luminance values between two different color
15 OLEDs while the integrated color produced by the combination of all the OLEDs has a constant chromaticity coordinate.

10. The display device claimed in claim 1, wherein the means for driving produces a variable ratio of luminance values between two different color
20 OLEDs while the integrated color produced by the combination of all the OLEDs has a constant chromaticity coordinate.

11. The display device claimed in claim 1, wherein the means for driving the OLEDs provides a means for converting a three-color input signal to a
25 four or more number of colors signal equal to the number of different color light emitting OLEDs in each pixel.

12. The OLED display device claimed in claim 1, wherein one or more of the additional OLEDs is cyan in color.

30

13. The OLED display device claimed in claim 1, wherein one or more of the additional OLEDs is yellow in color.

14. The OLED display device claimed in claim 1, wherein one or more of the OLEDs are formed by patterning different emissive materials that emit light of different colors to form the OLED.

5

15. The OLED display device claimed in claim 1, wherein one or more of the OLEDs are formed by patterning a white-light emissive material.

16. The OLED display device claimed in claim 15, wherein the color of one or more of the OLEDs is produced using a color filter.

10

17. The OLED display device claimed in claim 15, wherein the color of one or more of the OLEDs is produced using a microcavity structure.

15

18. The OLED display device claimed in claim 1, wherein the OLEDs are of different sizes.

19. The OLED display device claimed in claim 1, wherein the additional OLED is larger than at least one of the red, green, or blue OLEDs.

20

20. The OLED display device in claim 1, wherein the OLED display device is a top-emitting OLED device.

21. The OLED display device in claim 1, wherein the OLED display device is a bottom-emitting OLED device.

25

22. The OLED display device in claim 1, wherein the OLED display device is an active-matrix device.

23. The OLED display device in claim 1, wherein the OLED display device is a passive-matrix device.

30

24. The OLED display device claimed in claim 1, wherein the means for driving reduces power usage to a minimum by selecting the combination of three OLEDs in each pixel that results in the lowest power consumption for producing a desired color in each pixel.

5

25. The OLED display device claimed in claim 1, wherein the means for driving produces colors near white using a combination of light from the additional OLED(s) and light from one or fewer of the two OLEDs with the lowest luminance efficiency.

10

26. The OLED display device claimed in claim 25, wherein the two OLEDs with the lowest luminance efficiency are the red and blue OLEDs.

27. The OLED display device claimed in claim 1, having two or
15 more additional OLEDs that expand the gamut relative to the gamut defined by the red, green and blue OLEDs, wherein one or more of the additional OLEDs emits cyan light and one or more of the additional OLEDs emits yellow light.

28. The OLED display device claimed in claim 27, wherein red
20 and yellow OLEDs are positioned next to one another.

29. The OLED display device claimed in claim 27, wherein blue and cyan OLEDs are positioned next to one another.

30. The OLED display device claimed in claim 27, wherein a
25 green OLED is positioned between yellow and cyan OLEDs.

31. The OLED display device claimed in claim 1, wherein the means for driving further comprises means for trading off power usage for display
30 lifetime.

32. The OLED display device claimed in claim 1, wherein the means for driving performs a conversion from an RGB signal to a device drive signal by calculation in real time.

5 33. The OLED display device claimed in claim 1, wherein the means for driving performs a conversion from an RGB signal to a device drive signal by referencing to a look-up table.

10 34. The OLED display device claimed in claim 1, wherein each pixel comprises two or more OLEDs for emitting a same color of light.

15 35. The OLED display device claimed in claim 34, wherein the two or more OLEDs that emit light of the same color in each pixel are additional colored OLED(s) that expand the gamut of the display device relative to the gamut defined by the red, green and blue OLEDs.

20 36. The OLED display device claimed in claim 34, wherein the two or more OLEDs that emit light of the same color in each pixel are one or more of the red, green or blue OLED(s).

 37. The OLED display device claimed in claim 34, wherein there are more green light emitting OLEDs in each pixel than red or blue light emitting OLEDs.

25 38. The OLED display device claimed in claim 34, wherein there are more red light emitting OLEDs in each pixel than blue light emitting OLEDs.

30 39. A method of reducing the power usage of an OLED display device according to claim 1, comprising the steps of:
 prioritizing all possible subgamuts which may defined by combinations of any three OLEDs of different colors within a pixel according to average efficiencies;

calculating the intensities required of the three OLEDs of each pixel which define the lowest priority subgamut that may be used to form each desired color;

- 5 successively adding any remaining more efficient OLEDs which do not make up the lowest priority subgamut to the combination of OLEDs which make up the lowest priority subgamut, and calculating the intensities required of combinations of the added OLEDs and two other of the OLEDs which define additional subgamuts which may be used to form each desired color; and
- 10 selectively driving the OLEDs in each pixel with a drive signal to reduce overall power usage while maintaining display color accuracy.